



Docket No. 979009-0111
(P99.2641)

PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Hatazawa *et al.*

Serial No.: 09/446,641

Examiner: T. Dove

Filed: December 22, 1999

Group Art Unit: 1745

For: SOLID-ELECTROLYTE
SECONDARY BATTERY

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DECLARATION UNDER 37 C.F.R. § 1.132

The Assistant Commissioner for Patents
Washington, D.C. 20231

Sir:

I declare that I am an inventor of pending application Serial Number 09/446,641, filed December 22, 1999.

I hereby declare as follows:

1. Batteries utilizing a fluorocarbon polymer having a weight-average molecular weight of greater than 580,000 as the matrix polymer of a solid electrolyte exhibit superior initial characteristics and long-term reliability relative to fluorocarbon polymer having a weight-average molecular weight less than 580,000.

2. An experiment was performed that evidences the criticality of utilizing a fluorocarbon polymer having a weight-average molecular weight of greater than 580,000 as the matrix polymer of a solid electrolyte. Eight plate-shaped gel electrolyte batteries, each having a fluorocarbon polymer with a different weight-average molecular weight, were prepared as in Experimental embodiment 3 on page 18 of the specification. The eight batteries were subjected to 1C charge/1C discharge cycle tests to measure discharge temperature characteristics from -20°C to a room temperature (23°C) after 500 cycles and 1000 cycles. The results of both cases are shown in the attached Figures 4 and 5.

3. Batteries utilizing a fluorocarbon polymer having a weight-average molecular weight of greater than 550,000 exhibit satisfactory discharge temperature characteristics from an initial state to 500 cycles, as recorded in Figure 4. However, after 1000 cycles, the discharge temperature characteristics become poorer, and especially under the temperature of lower than 10°C, the deterioration of the discharge temperature characteristics of batteries

utilizing a fluorocarbon polymer having a weight-average molecular weight of less than 580,000 is great, as recorded in Figure 5.

4. It is preferable in the art to maintain discharge temperature characteristics by 70% or more after long-term use from the initial state to secure the quality of the product for the user. Figure 5 depicts a large difference in the discharge temperature characteristics between a battery utilizing a fluorocarbon polymer having a weight-average molecular weight of greater than 570,000 and that of 580,000. Therefore, this experiment demonstrates that a solid electrolyte secondary battery having both superior initial characteristics and long-term reliability can be provided when a fluorocarbon polymer having a weight average molecular weight of greater than 580,000 is used as the matrix polymer of a gel electrolyte.

5. I further declare that all statements made herein of my own knowledge are true, that all statements made on information and belief are believed to be true, and that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both (18 U.S.C. § 1001), and may jeopardize the validity of the application or any patent issuing thereon.

Tsuyonobu Hatazawa
TSUYONOBU HATAZAWA

November 21, 2001
Date

Koichiro Kezuka
KOICHIRO KEZUKA

19th, NOV, 2001
Date

Yukiko Iijima
YUKIKO IIJIMA

21th, Nov, 2001
Date